THE NATURAL MOVEMENT OF WHEAT AND FLOUR WITHIN THE UNITED STATES

by

ROBERT MILES PEASE, JR.

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INTRODUCTION TO THE NATURAL MOVEMENT OF WHEAT AND FLOUR WITHIN THE UNITED STATES AND THE PURPOSE OF THIS STUDY

The natural movement of wheat and flour within the United States is a phenomenon which has formed itself into one of the most important phases of the flour milling industry. To understand the meaning of the natural movement of wheat and flour, it is first necessary to have a basic understanding of wheat and flour production.

The Growing of Wheat and the Milling of Flour

The growing of wheat and the milling of wheat flour are two of the oldest and most extensive industries in the United States. There are practically no patent problems involved in these industries, and anyone with the necessary capital and knowledge is in a position to enter the industries. Many millions of acres of this country's land are planted to wheat annually. In some sections almost the entire agricultural population is engaged in the production of wheat. In these regions wheat-growing has become almost permanent. It has become an extensive system of one-crop production. This is due to many factors. Two of the most important factors are the scarcity of rainfall at some seasons of the year, especially in summer, and occasional droughts. In these sectors of one-crop production, wheat becomes merely a cash crop while the food supply must come from other sources. This causes surpluses

of wheat in these regions.

Classes of Wheat. All wheats, whether of winter or spring habit of growth, are classified by the United States Department of Agriculture into six market classes. Those wheats with winter habit are classed as hard red winter, soft red winter, or white wheat. Those wheats with spring habit are classed as hard red spring, durum, red durum, and white wheat. Some varieties of white wheat have winter habit while others have spring habit. The names of these classes are in general descriptive of their hardness or softness, of their external color, and of their winter or spring habit. A seventh market class, mixed wheat, includes all mixtures of wheat not provided for in the six major market classes.

It is important to recognize these different market classes of wheat because flour manufactured from each differs from that made from the other classes. Hard red winter wheat flour is a bread or biscuit flour, varying in strength according to protein quantity and quality, variety, location, climate, damage, foreign material, moisture content, and other factors. These factors apply to all of the market classes of wheat. Soft red winter wheat makes a cake or pastry type of flour, or a softer family flour. White wheat may make a family flour or a cake or pastry type of flour, depending upon its strength or lack of strength. Hard red spring wheat is used for bread flour and is especially desired by the bakery industry in the North Atlantic and Pacific Coast states. Durum wheat is used for the manufacture of semolina, with which macaroni, spaghetti, vermicelli,

and the like are made. Red durum wheat is used primarily for feed purposes.

In the United States, hard red winter wheat is grown in the arid Great Plains region between the Rocky Mountains and the Mississippi River. Soft red winter wheat predominates in the more humid territory east of the Mississippi River. White wheat of the softer type is grown primarily in Michigan, New York, Idaho, California, Oregon, and Washington. Of the hard wheats, the hard red winter varieties are best adapted to Texas, Oklahoma, Kansas, Nebraska, and Colorado. The hard red spring varieties thrive in the states where the winters are too cold for wheat to survive if planted in the fall. Montana, North Dakota, South Dakota, and Minnesota are the greatest producers of hard red spring wheat. Durum and red durum wheats grow best in the Dakotas and Minnesota. In the Pacific Coast regions, depending upon climatic conditions, soft red winter and the softer white wheat varieties predominate. Some hard red winter, hard red spring, and white wheat of the harder varieties are grown there. Particular varieties within these classes are especially adapted to local conditions within these regions.

The Milling of Flour. The process of milling wheat into flour consists of selecting, blending, and cleaning the wheat berry, and separating the outer coating or husk, known as bran, from the inner part or starchy substance. The latter substance, known as the endosperm, constitutes the wheat flour. This separation is accomplished through a process of grinding,

sifting, regrinding, and resifting so as to extract the particles of bran from the endosperm, and to separate the starchy particles into different grades, some or all of which are blended together to make different grades of flour.

Types of Flour. There are in general three major types of flour for human consumption depending upon their use: (1) Flour for the bakery and commercial trade; (2) flour for the home or family trade; and (3) flour for special uses. There are several sub-types of flour within these three major classifications, and these sub-types vary depending upon the kind of final product that is to be produced by using flour as the basic ingredient. The various types and sub-types are obtained in the milling process primarily by selection and blending of various classes of wheat, but also to a minor degree through variations in the process of milling the wheat.

A great percentage of the wheat flour produced finds its way into the bakery and commercial flour trade. This trade is highly competitive, exacting and selective in its requirements. Commercial bakers set standards and specifications for the flour they desire, depending upon the kind of product they intend to bake. Thus, a miller is required to produce a different kind of flour for use in making pastry as contrasted with that used in making bread. This requirement places upon the miller the necessity of selecting the type of wheat necessary to meet the specifications of the baker. In this connection, attention should be called to the fact that any individual

mill has only certain classes of wheat available for milling, and that most mills are so constructed as to produce the flours which are most in demand from these classes of wheat. This limitation is important in the bakery industry from the competitive point of view in as much as bakers frequently specify flour produced from one of the major classes of wheat, and unless the miller has that particular class available to him, he is not in a position to compete for that part of the bakers' business. It is true, of course, that bakers will buy flour made from various classes of wheat, but they usually do so on specifications and for the purpose of producing a particular product, or for blending the flour in the bake shops in order to obtain certain baking characteristics they desire. To this extent, in the bakery industry, flour produced from wheat of the different market classes is not always directly competitive.

There are three major types of flour produced for the family-flour trade: all-purpose, biscuit, and high protein flour. All-purpose flour is milled from a blend of medium protein content hard red winter wheat and is designed to give reasonably good results for any type of home baking. Biscuit flour is milled from a blend of one or more of the softer white, soft red winter, or low protein content hard red winter types of wheat and is the almost universal flour used in the southern states. High protein flour is milled from a blend of hard red spring and hard red winter wheats and is used primarily to

produce hearth breads and similar items by persons of foreign extraction residing in the North Atlantic states. As in the case of flour for the bakery and commercial trade, a miller is not in a position to produce all of the types of family flour unless he has available the particular class of wheat necessary for each type. To this extent, in the family-flour trade, flour produced from wheat of the different market classes is not always directly competitive.

Types of flour for other uses are primarily the following: semolina, which is milled from durum wheat and is used in the manufacture of macaroni, spaghetti, and the like; and whole wheat flour, the most desirable grade of which is milled from high protein hard red spring wheat. In addition, there are various special-purpose flours or pre-mixed flours, usually used in the home in the preparation of such products as cakes, pancakes, pastries, biscuits, or muffins.

This explanation, though quite general, will be satisfactory for an understanding of this study. However, certain points will be more fully clarified and elaborated. The more important of these are the production of wheat, the production of flour, and the consumption of the flour.

Purpose of the Study of the Natural Movement

The purpose of this study is to indicate the physical distribution and major influences responsible for the distribution of wheat and flour within the United States. These

influences indicate not only the short-run changes but also the long-run changes in this distribution. This study must be understood to rest between the two spheres of production and consumption.

Many studies have been made relative to this subject. These studies are so numerous in connection with grain and other agricultural products that it is impossible to pretend to have made the acquaintance of all these publications which present theory and statistical data on the subject. These investigations include studies in economics, economic geography, agricultural marketing, farm management, commerce, and transportation. Each of these fields covers a great scope in relation to this subject. This is due to many factors. The most important of these is that soil is the most plentiful of our natural resources, and wheat is one of the most important plants grown in the soil.

This study falls within the field of economic geography which habitually covers the stages through which goods pass from the producer to the consumer. However, economic geography seldom utilizes statistical data for any purpose other than illustration. Descriptive presentation and general statements are the tools which replace statistical proof. The economic geographer seldom limits himself to any given area but takes into consideration the affecting factors throughout the world.

If only the final stages of distribution of goods were considered, the study would be one of marketing. This field

concentrates upon the consumer and the part which is played by the facilities most closely connected to the consumer with little emphasis upon the producer. Marketing studies seldom cover any given territory but tend to give data upon the greater-consuming and the little-consuming areas. The areas which consume the goods produced locally are usually neglected.

Farm management studies are likely to emphasize the production of agricultural products and those distribution facilities most closely allied with production. These studies seldom give adequate consideration to those factors of distribution from the primary market to the consumer of agricultural products. These studies seldom consider the final state in which these products are consumed and the means by which they reach their intermediate or final forms.

A student of transportation is likely to concentrate upon the physical facilities without realizing that one of transportation's greatest factors is commerce, that is, the transportation of goods from where they are plentiful to where they are scarce. He fails to take into consideration that these goods do not move in a straight line, but through the many facilities of commerce. The facilities of marketing and manufacturing are given only passing attention by transportation studies.

All of these fields of study do fall within the scope of the economist who should be able to give easily a general title to the combination. This title should be adequate and

descriptive. However, no title has been assigned to a study such as this. The economist has already used the most likely terms to refer to other subjects. The most desirable terms are disposition and distribution.

Disposition is used by the economist to mean the division of goods as to use without changing the original state in which the goods exist. This is exemplified by the fact that the disposition of wheat is the amount used for seed, feed, flour, and other uses. This does not take into consideration where the goods are used.

Distribution has been given an economic meaning different from that desired here. When the economist refers to distribution he is usually referring to the distribution of money income to individuals or groups of individuals. However, when Mussey and Donnan (25, p. 570) analyzed the meaning of money income distribution they reached the conclusion that the real meaning is the distribution of goods. Wheat and wheat flour are among the most important goods distributed to nearly all individuals within the United States. This makes the term distribution particularly applicable, but to eliminate confusion this term must be discarded.

Natural movement has been chosen to refer to the usual movement of wheat and wheat flour from the producer to the consumer. This phrase is not new. It is used by the grain and milling industries to refer to this subject. The origin of the phrase is unknown. It is adequate and descriptive.

This phrase connotes the true purpose of this study which is to describe and analyze the natural movement of wheat and flour within the United States.

WHEAT PRODUCTION, FLOUR PRODUCTION, AND FLOUR CONSUMPTION WITHIN THE UNITED STATES

Wheat Production

In any discussion concerning industrial production, the major raw material is of foremost importance. In the flour milling industry the basic raw material is wheat. As a means of describing the production of wheat within the United States, the individual state has been chosen as the descriptive division. The wheat crop of 1946 has been chosen as a crop which gives a representative production year and which is the latest year for which statistics are available for comparison with other factors. This single year was chosen in preference to an average of years in that the amount of wheat grown in certain regions of the country has changed materially during the last decade. It is believed that wheat production trends will continue in the same manner in the coming years. If an increasing or lessening of total production occurs, it probably will be general in character. This would not affect the regional comparisons. This wheat production by states is shown in Table 1.

Table 1. Wheat production by states for 1946.

State	Wheat production[1]	Wheat sold[1]
	Thousand bushels	
North Atlantic States		
Maine	21	10
New Hampshire	--	--
Vermont	--	--
Rhode Island	--	--
Massachusetts	--	--
Connecticut	--	--
New York	5,648	2,877
New Jersey	1,550	712
Pennsylvania	19,912	10,729
South Atlantic States		
Delaware	1,216	904
Maryland	7,320	5,599
District of Columbia	--	--
Virginia	8,344	4,779
West Virginia	1,463	652
North Carolina	6,307	3,474
South Carolina	2,706	1,800
Georgia	2,093	1,230
Florida	--	--
Southern States		
Kentucky	4,158	2,862
Tennessee	3,878	2,251
Alabama	174	93
Mississippi	198	92
Louisiana	--	--
Arkansas	420	229
Northwestern States		
Ohio	48,522	35,772
Michigan	22,896	15,921
Illinois	19,361	16,104
Indiana	29,369	22,313
Wisconsin	2,263	828
Minnesota	27,080	21,261
North Dakota	139,824	125,844
South Dakota	53,197	47,812
Iowa	4,335	3,244

Table 1 (concl.).

State	Wheat production[1]	Wheat sold[1]
	Thousand bushels	
Southwestern States		
Missouri	18,195	12,496
Nebraska	90,677	83,737
Kansas	212,977	197,769
Oklahoma	88,262	78,825
Texas	62,916	57,296
Western States		
Montana	62,888	56,463
Idaho	34,846	29,196
Wyoming	6,232	5,522
Colorado	37,080	33,243
New Mexico	2,895	2,359
Arizona	567	448
Utah	6,981	3,736
Nevada	545	138
Washington	77,965	73,156
Oregon	25,168	21,995
California	12,897	11,233
United States	1,153,046	995,004

[1]Farm production, farm disposition, and value of principal crops (13, p. 2).

Wheat production is controlled by many factors. According to Jasny (19, p. 121), the major factors are climate, soil, breeding, competing crops, and topography of the land. These factors are important in determining quality as well as quantity of wheat produced. Soil and climate are the most important factors in most regions. They control to a considerable extent the amount of wheat grown in any given region. Topography of the land is a definite limiting factor, for without great areas of level or near-level land the machines of modern agriculture would not be able to operate. Breeding of wheat varieties has become more important in the last few years in improving the quality and the quantity of the wheat produced. Competing crops many times have replaced wheat after several years of adverse growing conditions. This factor is not important today, but it has been in the past and may be in the future.

Soil is of particular importance in the production of wheat. In many of the wheat-growing regions of the United States the soil is comparatively dry. This soil contains only a small quantity of humus and produces wheat of medium strength. This wheat mills into excellent low protein flour with a good color and good baking characteristics. Other soils found in the United States produce other desirable and undesirable characteristics in wheat. Buechel (6, p. 422) states that each variation of soil varies the characteristics of the wheat grown in it. Breeding programs have attempted to

develop varieties which are best suited for each major variation in soil. This is one of the major reasons why the types of wheat vary from region to region.

Climatic variations have an effect much like soil variations. Wheat will grow in most parts of the United States, but the quantity of wheat produced depends many times upon the coldness of the winter, the length of the growing season, and the amount of rainfall. A good example of this is durum wheat which will not grow as well as other classes in regions of heavy precipitation according to Jasny (19, p. 124). Wheat must have a minimum amount of moisture to thrive or other crops, which require less moisture, will be substituted. Wheat may be replaced by barley under such conditions. If the climate is too moist, wheat may be replaced by corn or oats. Salmon and Throckmorton (31, p. 9) state that wheat requires an annual rainfall of not less than 20 inches and not more than 60 inches. Another important climatic condition is that to grow winter wheat, a cool temperature must prevail during part of the year. All of these factors must be considered when studying wheat production.

Flour Production

The flour production for the crop year of 1946-47, the same year used for wheat production, is given in Table 2. Flour production should not be confused with milling capacity.

Table 2. Flour production by states for the crop year, 1946-47.

State	Approximate amount of wheat required for milling[1]	Flour production[2]
	Thousand bushels	Thousand cwts.
North Atlantic States		
Maine	--	--
New Hampshire	--	--
Vermont	--	--
Rhode Island	--	--
Massachusetts	--	--
Connecticut	--	--
New York	78,080	34,246
New Jersey	--	--
Pennsylvania	6,236	2,735
South Atlantic States		
Delaware	--	--
Maryland	3,226	1,415
District of Columbia	--	--
Virginia	8,461	3,711
West Virginia	709	311
North Carolina	4,558	1,999
South Carolina	800	351
Georgia	1,742	764
Florida	--	--
Southern States		
Kentucky	8,616	3,779
Tennessee	11,110	4,872
Alabama	--	--
Mississippi	--	--
Louisiana	--	--
Arkansas	--	--
Northwestern States		
Ohio	21,455	9,410
Michigan	10,328	4,530
Illinois	31,312	13,742
Indiana	10,032	4,400
Wisconsin	5,243	2,291
Minnesota	89,918	39,436
North Dakota	10,780	4,728
South Dakota	--	--
Iowa	10,905	4,782

Table 2 (concl.).

State	Approximate amount of wheat required for milling[1]	Flour production[2]
	Thousand bushels	Thousand cwts.
Southwestern States		
Missouri	59,720	26,193
Nebraska	19,012	8,339
Kansas	113,398	49,736
Oklahoma	31,877	13,981
Texas	48,721	21,369
Western States		
Montana	9,505	4,169
Idaho	5,429	2,381
Wyoming	--	--
Colorado	12,107	5,310
New Mexico	--	--
Arizona	--	--
Utah	8,019	3,517
Nevada	--	--
Washington	28,523	12,510
Oregon	17,399	7,631
California	11,161	4,895
Others[3]	5,988	2,627
United States	684,368	300,162

[1]Calculated by dividing the total flour production in the United States into the total wheat ground, and using this factor (2.28) multiplied by the flour production of each state to secure the approximate amount of wheat required for milling. The Northwestern Miller (35, p. 26-27).

[2]The Northwestern Miller (35, p. 27).

[3]Includes Alabama, Arizona, Arkansas, Delaware, District of Columbia, Louisiana, New Hampshire, New Jersey, New Mexico, South Dakota, and Wyoming.

Milling capacity is the total amount of flour a mill or any group of mills could produce if the mill or mills were operated continuously at capacity. A flour mill is a group of machines and as such requires maintenance and repair which cannot be performed while the mill is being operated at capacity. Also, flour salesmen are not usually able to sell the total amount of flour the mill could produce if it were operated continuously. Milling capacity is a theoretical figure which is seldom equalled by any mill or group of mills. This theoretical figure is stated in hundred-pound units of flour milled in a 24-hour working day. Flour production is the actual amount of flour produced by a mill or group of mills any given period of time. It is of much greater importance than milling capacity.

By comparing the wheat production with the flour production of any state it is possible to reach the theoretical amount of wheat the mills of the state need from other states, or the surplus of wheat which was not required for milling within the state. This theoretical amount of wheat would be of little importance. It would not indicate the actual amount of wheat needed from other states or in surplus in the state. The difference is due to the fact that wheat is used for purposes other than for milling into flour. Seed and feed are two other important uses. The difference is also due to the fact that all wheat is not of milling quality and that wheat not suitable for milling must be used for other purposes.

This theoretical amount of wheat needed from other states, or in surplus within the state, calculated from the amount of wheat sold is a good indicator of the states which produce much more wheat than is needed for milling, or need much more wheat for milling than is grown within the state.

Flour Consumption

Flour consumption is unknown for any given region in the United States. An approximation of the flour consumed in each state is given in Table 3. This approximate consumption is given for the period of the crop year of 1946-47. The amount of flour produced in each state was given for the same period in Table 2, but the amount consumed cannot be compared, accurately, to the amount of flour milled. This is due to the fact that the type of flour milled within any given state may be more than is consumed within the state, but it may not be the type of flour which is utilized within the state. This would cause the consumers of the state to demand flour from mills in other states. Therefore, it is necessary to describe the condition which exists within each state more fully. This has been done in the latter part of this study.

Table 3. Approximate flour consumption by states for the crop year 1946-47.

State	Approximate population[1]	Approximate flour consumption[2]
	Thousands	Thousand cwts.
North Atlantic States		
Maine	894	1,330
New Hampshire	532	972
Vermont	358	533
Rhode Island	753	1,110
Massachusetts	4,708	7,006
Connecticut	1,992	2,964
New York	13,917	20,708
New Jersey	4,369	6,501
Pennsylvania	10,152	15,106
South Atlantic States		
Delaware	290	432
Maryland	3,201	3,275
District of Columbia	852	1,268
Virginia	3,002	4,467
West Virginia	1,828	2,720
North Carolina	3,679	5,474
South Carolina	1,913	2,847
Georgia	3,181	4,733
Florida	2,352	3,500
Southern States		
Kentucky	2,751	4,093
Tennessee	3,028	4,505
Alabama	2,816	4,190
Mississippi	2,096	3,113
Louisiana	2,534	3,771
Arkansas	1,894	2,818
Northwestern States		
Ohio	7,645	11,376
Michigan	6,157	9,162
Illinois	8,124	12,089
Indiana	3,813	5,674
Wisconsin	3,226	4,800
Minnesota	2,859	4,254
North Dakota	545	811
South Dakota	556	827
Iowa	2,575	3,804

Table 3 (concl.).

State	Approximate population[1]	Approximate flour consumption[2]
	Thousands	Thousand cwts.
Southwestern States		
Missouri	3,815	5,677
Nebraska	1,288	1,916
Kansas	1,892	2,815
Oklahoma	2,268	3,375
Texas	6,999	9,415
Western States		
Montana	486	723
Idaho	481	716
Wyoming	269	400
Colorado	1,147	1,707
New Mexico	544	809
Arizona	640	953
Utah	637	948
Nevada	138	205
Washington	2,244	3,339
Oregon	1,485	2,210
California	9,714	14,454
United States	141,639	209,715

[1]Median between the Population estimates (30) of July 1, 1946, and Population estimates (31) of July 1, 1947.

[2]Approximate population multiplied by the median (1.448 cwts.) of the per capita flour consumption in the United States for the calendar years of 1946 and 1947. The Northwestern Miller (35, p. 72).

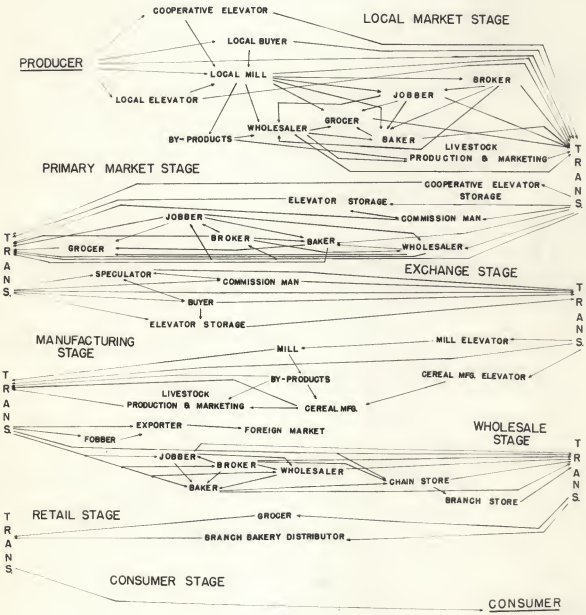
THE SERVICES FACILITATING THE NATURAL MOVEMENT AND THE CAUSES OF THE NATURAL MOVEMENT OF WHEAT AND FLOUR WITHIN THE UNITED STATES

Services Facilitating the Natural Movement

Definite classes of wheat are produced in definite areas of the United States. This specialization is the result of an intelligent adaptation of the population to its environment. This has caused the need for more efficient services to insure the continuous flow of wheat and flour from the producer to the consumer. This need has given rise to a systematic scheme of commerce. There are many levels of trade and many individuals who contribute their services to the scheme. Plate I shows the major groups of individuals and their position in this scheme. The system used in presenting these services which facilitate the natural movement is arbitrary, for the interaction which occurs between each of these groups of individuals is not rigidly defined. One individual has been known to participate in several of these services at the same time. However, this chart does show the major services and the major flow of wheat and flour from one service to another. These services are operating effectively only in the United States and should not be taken to represent the services operating within other nations, especially those nations with economic systems different from that system in operation in the United States. The service performed by each of these

PLATE I

MAJOR SERVICES FACILITATING THE NATURAL MOVEMENT OF WHEAT & FLOUR WITHIN THE UNITED STATES



groups of individuals has been defined generally by many economists and need not be redefined here.

There are many contributing services which are not shown in Plate I. These contributing services apply directly to nearly all of these groups of individuals, or they apply indirectly by being a major cost factor influencing price. The major contributing services are: (1) Marketing information which is dispersed by telephone, telegraph, ticker, and other news facilities; (2) financing; (3) insurance; (4) grading and mixing of wheat; and (5) supplies including containers, equipment, fuel, tools, secondary ingredients, and other miscellaneous items of lesser importance. From this list it is easily understood why these services are important. Without these contributing services the major services would not be able to operate efficiently, if at all, in some cases.

Causes of the Natural Movement

The factors which cause the natural movement of wheat and flour within the United States are so numerous that it is difficult to determine which ones are the most significant.

The price relationship to the cost of delivering wheat or flour to a consumer, manufacturer, or handler in any particular place is one of the most important factors. This could be stated more simply as the theory of supply and demand. The aggregate costs of supplying wheat or flour to any point

cannot exceed the amount an individual is willing to pay for the use of this wheat or flour. The price of wheat becomes a cost factor in determining the price which the miller demands before his flour will move to any given market. The United States has an economic system which normally allows the price of wheat to fluctuate in response to supply and demand. This fluctuation in price is transmitted rapidly to a majority of manufacturers, handlers, and consumers. Frequently, there is a lag in the shifting of price downward at the level of the small package flour consumer. This lag is due to the grocer who wishes to retain the profit he originally calculated upon the purchase price of the flour. The fluctuation in the price of wheat in general does not have the same effect upon the miller and handler of wheat and flour as it does on the grocer in many cases. The handler of wheat and flour usually utilizes the future grain market to hedge his wheat or flour and minimize the speculative loss or profit. The handler realizes his income from the fixed charge which he adds to the price of the wheat or flour for the services he renders. The miller also hedges his wheat and flour and realizes his income from a conversion charge which he adds to the price of the flour. From these facts it is obvious that the basic cost in the milling industry and the allied industries is the market price of wheat. This price is virtually the same at most points within the United States at any moment if other costs of handling, converting, and transportation

are neglected.

The cost of transportation is one of the most important factors influencing the natural movement of wheat and flour within the United States. Most wheat is transported from the producer to the local market in trucks. From the local mill or elevator, wheat and flour are transported by truck, boat, railroad, or a combination of these three to the consumer. The greatest quantity is transported by rail. Water transportation is less expensive than rail transportation, but it is slower and not available at all points. Truck transportation is not so fully developed as rail transportation, but it is developing rapidly and may in the future be of greater importance than it is today. It is an exception when wheat and flour are not moved by rail. The railroad rates in most areas are the same for wheat and wheat products. This limits the wheat and flour industries to one rate between any two points. Locklin (22) points out that this rate is based on two important principles: (1) The amount of freight charges the traffic will bear, and (2) the distance the goods must be shipped. The amount of freight rate the traffic will bear takes into consideration the value of the goods being shipped and the competitive situation which prevails between these goods and goods which they would replace or which would replace them if the rates were altered. It is recognized that goods will move only as long as the cost of transporting them is not too great a percentage of the value of the goods,

and as long as these goods can compete with the goods already available at any given market. The distance the goods must be shipped takes into consideration the cost of shipping these goods this distance. Also considered is the amount of traffic moving in the same direction over the same route. This is important in that railroad costs diminish per unit as the traffic increases to an optimum which has seldom been reached by any railroad in the United States. All of these factors are considered when freight rates are established between two points unless special equipment or special privileges are necessary to transport the goods. Wheat and flour require only standard box cars or automobile cars, but wheat does require grain doors, the cost of which is taken into consideration. Wheat and flour have a special privilege between many points in the United States. This is called an "In-Transit Privilege" or "Transit". This privilege is granted in order to equalize freight charges and to eliminate discrimination which cannot be eliminated by other means. Wilson (37, p. 99) states that transit is the privilege of shipping wheat from a point of origin to an intermediate point, and reshipping either wheat or wheat products from the intermediate point to the point of destination on a rate calculated between the point of origin and the point of destination. This privilege must be taken into consideration when establishing freight charges. When all of these factors are considered it is easily understood why freight rates vary so widely. This

variation is one of the reasons wheat and flour can be shipped only to certain points from any one given point and be expected to compete for a place in the market.

Wheat and flour will compete under adverse conditions only if there is demand for a special or superior quality of wheat or flour which is not available except at a premium price. This demand is exemplified by durum wheat which is grown only in certain regions of the United States, but the products manufactured from it are in demand for special use throughout the nation.

These are the important factors which control the natural movement. It should be understood by now that certain classes of wheat are grown in certain areas, certain types of flour are milled in certain areas, and demand for flour of certain types exists in certain areas; and that it is the wheat and flour of the type in demand with the lowest price that will be consumed within any given area so far as the natural movement is concerned.

DESCRIPTION OF THE NATURAL MOVEMENT OF WHEAT AND FLOUR WITHIN THE UNITED STATES

The causes of the natural movement within the United States have been thoroughly discussed. These causes must be kept in mind when breaking down the United States into divisions so as to describe the continuous movement of wheat and flour. This division, by states and by regions, exemplifies the

causes of the natural movement and shows how each section of the United States has become more specialized in order to accomplish these functions of production and distribution for which it is best suited and for which the demand is the greatest.

The United States is divided into six regions for this purpose. These regions are the North Atlantic states, the South Atlantic states, the southern states, the northwestern states, the southwestern states and the western states. Each of these regions is discussed separately in the following pages.

The North Atlantic States

The region which is recognized for its industrial specialization is the North Atlantic. This region includes the states of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, and Pennsylvania. These states form one of the greatest consuming regions within the United States. However, each state has its own characteristics which should be discussed.

Maine. The state which is farthest northeast in the United States is Maine. It grows only a part of the wheat which is utilized in its mills. If all of the wheat sold by the producers were of milling quality, the state of Maine would still require twice that much wheat in order to operate the

mills within its borders. All of the wheat grown is not of milling quality and that which is not is utilized as livestock feed. In fact, more wheat is used as feed and seed than is sold on the market. The wheat that reaches the market is mostly hard red spring wheat which is milled and consumed locally. Some white wheat is grown and milled into biscuit flour. This is also consumed within the state. The growing of wheat and the milling of flour in Maine are confined to the northern section for the most part. The central and southern sections must rely upon other regions of the country for their wheat and flour. Maine falls into the classification of states with small mills and without recognized terminals, gateways, or milling centers. This is generally true of most of the states in New England, which makes them dependent upon a large number of other states for wheat and flour.

New Hampshire. The state of New Hampshire grows such a small amount of wheat that production figures are not published. It has only one mill of importance. This mill is in Penacook. New Hampshire does consume some wheat and a considerable quantity of flour. Nearly all of these products must be shipped from states which produce more than they can consume locally.

Vermont and Rhode Island. Vermont and Rhode Island are in much the same category as New Hampshire. However, these states are more dependent on other states for wheat and flour

in that they have only a few small mills. Practically all of their wheat and flour must come from other regions.

Massachusetts and Connecticut. The states of Massachusetts and Connecticut could be grouped with Vermont except that each of these states has two mills of some importance. These mills produce only a minor part of the flour consumed within these states. In fact, the six states which have been discussed could be classified as nonproducing states as far as wheat and flour are concerned. They do form an important part of the natural movement. They cause a continual demand for some wheat and a large quantity of flour. These products can be shipped from the states which have great surpluses to any one of the New England states for approximately the same cost. Therefore, these six states can be grouped together for purposes of further consideration. It is important to realize that the cost of shipping flour to any point within this group is essentially the same from any particular point outside the group. However, the cost is not the same from all points outside the group which causes competition among the many mills supplying the demands of these six states.

New York. One of the most important states in the North Atlantic group is New York. It is not a major wheat-producing state, but it is a most important milling and flour-consuming state. In the western part of New York a considerable amount of white wheat is grown. The central and southern sectors of the state produce some soft red winter wheat and hard red

spring wheat. It may be assumed that all of this wheat of better quality is milled in New York, for the greatest milling area in the United States is centered about Buffalo. The wheat grown in the state will fulfill only about one-fifteenth of the requirements of the mills of Buffalo and the other mills within the state. In addition to Buffalo, the other large mills are located in Lockport, Pittsford, and Baldwinsville. The latter is a mill which specializes in the milling of durum wheat. The flour production in New York is greater than the consumption. The surplus flour moves by rail to the other New England states, or it is exported to foreign countries. The wheat of poorer quality is exported, or it is utilized as livestock and poultry feed within the state.

New Jersey. The wheat grown in New Jersey is mostly consumed locally. This wheat is predominately soft red winter wheat grown in the central part of the state. Some white wheat is grown in the northern part of New Jersey, and some hard red winter wheat is grown in the southern sector. That wheat which is of milling quality is milled in the larger mills in Clifton and Rahway and in the small mills scattered about the state. However, these mills do not produce an adequate supply of flour for local consumption, causing a large amount of the needed flour to be shipped into New Jersey.

Pennsylvania. The last state in this group is Pennsylvania. At one time this state was recognized as the greatest wheat-growing state in the United States, but today it is

far down the list of the major wheat-producing states. The wheat grown in Pennsylvania is predominately soft red winter wheat. The central and southeastern sections of the state produce the largest amount of this market class of wheat. Lesser amounts of white wheat are grown in northcentral Pennsylvania, as well as some hard red winter wheat in the northeastern sector of the state. This wheat is mixed with other wheat moving through the state for export from Philadelphia and Baltimore. This makes it difficult to calculate what part of the wheat grown in Pennsylvania is milled within the state. It can be assumed that most of the better quality wheat is milled in Pennsylvania. Some of the soft red winter wheat is known to move by rail and water to the New England states and to the South Atlantic states. This wheat is noted for the particularly good biscuit flour which is milled from it. This flour is the specialty of the many small mills and the larger mills in Highspire, North East, Treichlers, and York. These mills ship some biscuit flour north and south, while a major part of the bread flour consumed within Pennsylvania is shipped into the state from the bread flour milling states of the Northwest and Southwest.

The South Atlantic States

The group of states south of Pennsylvania, the majority of which border on the Atlantic Ocean, are known as the South

Atlantic states. This group of states includes Delaware, Maryland, the District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, and Florida. The last four of these states could be included in a group of states known to the milling industry as the Southeast.

Delaware. The first state in this group is Delaware. Some soft red winter wheat is grown in the central part of this state. This wheat is utilized locally for feed and for milling into biscuit flour, as a specialty. The mills in Delaware are small, and they do not produce a sufficient amount of flour for local consumption. The major part of the flour must be shipped into the state from mills in other states.

Maryland. The state of Maryland may be included in the list of major wheat-producing states. However, it is not in the same classification as the major wheat-producing states in the Northwest or Southwest. Maryland does produce more wheat than most of the other Atlantic Coast states. Its wheat growing centers are in the central and western parts of the state, and its production is predominately soft red winter wheat. Much of this wheat moves through Baltimore to the north and south by rail and water, and to foreign countries. The better quality wheat is milled within Maryland in the small mills scattered over the state or in the larger mills in Hamstead and Westminster. The flour from these mills is consumed locally, as well as shipped north and south along the coast. This flour is mostly of the biscuit type, while the bread-type flours consumed in Maryland must be shipped

into the state for the most part.

District of Columbia. The District of Columbia could be considered as producing no wheat. If any wheat is grown in this small, heavily populated region the amount is only negligible and no information is available concerning it. There is only one flour mill in the District of Columbia, and it produces only a small percentage of the flour consumed locally. The wheat and flour needed in the District of Columbia must be shipped from other states.

Virginia. The state of Virginia is one of the major wheat-producing and major flour-milling states. Soft red winter wheat is grown throughout Virginia except on the eastern and western extremities with the greatest producing area centered in the Shenandoah Valley. Much of the wheat is utilized as livestock feed, only the best quality moving to the mills. The larger mills in Virginia are located in Lynchburg, Richmond, Staunton, Harrisburg, and Winchester. These mills must draw wheat from other states to supplement local production in order to fulfill their requirements. Some of the less desirable wheat grown in the northern sector of Virginia moves to Baltimore for export, and a considerable amount of the wheat grown in the central and southern parts of Virginia, as well as wheat from other states, moves through Richmond for export from Norfolk.

Much of the flour milled in Virginia is biscuit and pastry flour. That flour which is produced in the southern part of

the state finds a ready market in the Carolinas and other southern points. That flour which is produced in the northern part of Virginia moves through Baltimore to the metropolitan areas on the North Atlantic coast and to foreign countries. Virginia does not mill enough bread flour for local consumption and must therefore draw upon mills in other states to fulfill this requirement.

West Virginia. West Virginia is not a major wheat-producing state. However, soft red winter wheat is grown in the central and eastern portions of the state. Some white wheat is grown in the northeastern part of West Virginia. This production does not fulfill the requirements of the many small mills and the larger mills in Charleston and Huntington. These mills must rely upon wheat from other states to fulfill their requirements. Also, the consumption of flour in West Virginia is greater than the flour production. The additional flour required must be shipped from mills in other states.

North Carolina. The state of North Carolina, as West Virginia, produces soft red winter wheat predominately. It also produces some white wheat. The soft red winter wheat is grown throughout the state; however, the greatest production is usually on the northern and southern extremities. White wheat is grown only in the central sector of the state. This wheat fulfills the requirements of the state adequately with a small surplus in most years. The milling in North Carolina is not as efficient. It consists of many small mills,

and larger mills in Durham and Laurinburg. These mills do not produce enough flour for local consumption. This causes North Carolina to be dependent on mills in other states for much of its flour.

South Carolina. South Carolina is in much the same classification as North Carolina as far as the production of wheat and the milling and consumption of flour are concerned. In the northwestern part of South Carolina more wheat is grown than in any other sector. Soft red winter wheat is the predominate wheat which is grown throughout the state. That wheat which is not utilized within South Carolina moves to Charleston for export. This usually is a significant percentage of the wheat grown in the state, in that there are only a few mills to utilize this production. All of these mills are small, and they are not able to produce enough flour for local consumption. Therefore, flour must be procured from mills in other states for consumption in South Carolina.

Georgia. The state of Georgia is known for the breads which its noted cooks produce. These breads are made from the soft red winter wheat grown in the northern two-thirds of the state and wheat from other states. Georgia does not grow enough wheat to fulfill the requirements of the many small mills scattered throughout the state and the large mill located at Rome. Some of the wheat is shipped to Savannah by boat but the major part of it moves to the mills in Georgia by rail. The flour consumption in this state is greater than the flour production. This makes Georgia another state which brings

flour into the state to fulfill its demand.

Florida. Florida should be classified as a nonproducing state in this study. The amount of the production of wheat and flour within the state is so small that no figures are published concerning it. The wheat and flour consumed in Florida move, for the most part, into the state by rail. However, some wheat and flour are carried by boat to Jacksonville for distribution throughout Florida and the Southeast.

The Southern States

The third group of states includes those states which are known in the milling industry for their large consumption of flour in the home. This group is known as the Southern States and includes the states of Kentucky, Tennessee, Alabama, Mississippi, Louisiana, and Arkansas. In recent years the consumption of bakery flour has been increasing in these states which indicates that more and more southern families are minimizing their home baking in preference for the commercial bakery products. As this trend becomes more pronounced it is probable that the consumption of flour in this region will decline to a greater extent than it has in the last few years.

Kentucky. The first state of the southern states is Kentucky. This state usually produces less than one-half of the wheat needed by the mills within its borders. Soft red winter wheat is grown predominately. The greatest amount of

this market class is grown in the central sector of the state. However, some hard red winter wheat is grown in the eastcentral part of the state. The larger mills in Hopkinsville, Lexington, and Louisville, and the many small mills distributed throughout Kentucky draw wheat from the northwestern states to supplement the local wheat. The flour produced in these mills is principally cake and pastry flour. This flour is consumed locally for the most part. Some of it is shipped to the North Atlantic states and some moves south to points between the Mississippi River and the Atlantic Coast. Much of the bread flour consumed in Kentucky is milled in the northwestern and the southwestern states, where wheats for this type of flour are more plentiful.

Tennessee. The state of Tennessee is classified much as Kentucky. The wheat grown in Tennessee is predominately soft red winter wheat. This wheat is found growing most abundantly in the central and eastern sectors of the state. However, this wheat production is insufficient to supply the milling demands within the state. Much of this wheat must be shipped to Tennessee from the Northwest and Southwest in order to meet the requirements of the large mills in Clarksville, Cleveland, Columbia, Franklin, Johnson City, Knoxville, and Nashville, and the smaller mills scattered throughout the state. These mills produce more cake and pastry flour than is consumed in Tennessee. This surplus flour moves to the eastern metropolitan areas and to southern points east of the

Mississippi River. This predominance of cake and pastry flour milling causes a shortage of bread flour within Tennessee. This shortage is alleviated by the movement of bread flours from mills in states to the north and west, where a surplus of bread flour prevails.

Alabama. Another of the southern states is Alabama. Some soft red winter wheat is grown throughout the state with concentrated production only in the northeastern part of the state. Alabama has a few small mills, the largest of which is located at Decatur. These mills require much more wheat than is grown in Alabama, and the people of the state consume more flour than the mills produce. The required amounts of wheat and flour are shipped to Alabama from many of the states to the north and west. It is most interesting to realize how many states supply wheat and flour to the Deep South. These milling areas are described in the discussion of the supplying states.

Mississippi. Mississippi is another state which is noted for its consumption of family flour. Some soft red winter wheat and a lesser amount of hard red winter wheat are grown in the northwestern part of Mississippi. The hard red winter wheat is utilized as feed; whereas, the soft red winter wheat is ground in the two small mills or mixed with wheat shipped by rail or down the Mississippi River by boat to this state. Although much of the wheat and flour moves to the Southeast by rail, the River has remained as a major and less expensive way

of transportation. The wheat and wheat products that move on the Mississippi River originate from most states through which the River and its tributaries flow plus several of the western states. These states compose the points which supply flour for the consumer in Mississippi.

Louisiana. Louisiana fits into this group of states quite readily. Unlike the two previous states, which produce a small amount of wheat, Louisiana produces no appreciable amount. The milling in the state is confined to one small mill which causes Louisiana to be dependent upon the mills of other states for the flour required within the state. However, it should be noted that New Orleans is one of the greatest ports in the world. From New Orleans many hundreds of thousands of bushels of wheat are exported each year. This wheat moves from the great wheat-producing areas served by the Mississippi River. It is from these points that Louisiana receives the wheat and flour it needs.

Arkansas. The last state in this group is Arkansas. Some soft red winter wheat is grown in the northern two-thirds of this state, and a lesser amount of hard red winter wheat is grown in the northeastern sector. This wheat composes only a small amount of the wheat required by the mills in Arkansas. These mills are relatively unimportant in that they do not produce enough flour for local consumption. Much of the wheat and flour required in Arkansas must be drawn from the great producing states to the West and North.

The Northwestern States

The fourth group of states is the northwestern states. Included in this group are the states which produce enormous amounts of spring bread wheats and spring wheat flour. This group includes the states of Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota, North Dakota, South Dakota, and Iowa. These states are served by a great network of railroads and two waterways for moving their surplus wheat and flour to the consuming areas of the East and South. The waterways utilized by these states are the Great Lakes and the Mississippi River System.

Ohio. The first state in this group and the one which is farthest east is Ohio. In this state is grown a considerable quantity of soft red winter wheat, and some hard red winter and white wheat. The soft red winter wheat is grown in the western two-thirds of Ohio. The hard red winter and the white wheats are grown in the northwestern sector of the state. Approximately 25 per cent of this production is utilized by the local demand, and much of the surplus wheat moves to the terminals in Toledo and Cincinnati. From these terminals it is shipped to the mills in the North Atlantic states and to the ports on the Atlantic for export. Also, part of this wheat moves south to the mills in the southern states. The mills in Ohio are scattered throughout the state. The larger mills are located in Cleveland, Dover, Fostoria, Kent, Loudonville,

Mansfield, Marion, Mount Vernon, Springfield, and Toledo. For the most part these mills specialize in the production of cracker, cake, biscuit, and pastry flour. This flour is consumed locally, and is shipped to the eastern metropolitan areas and to the near Southeast. This flour production in Ohio is supplemented by bread flours from the mills in the western part of the northwestern states in order to fulfill local demand.

Michigan. Michigan is outstanding in the production of pastry flour and the wheat to make this flour. This wheat is predominately white wheat of the softer varieties. Some hard red spring wheat is grown in the northern sector of Michigan, and some soft red winter wheat is grown in the southern section. About 10 per cent of this wheat is not utilized within the state, and it is shipped to the mills in the North Atlantic states. This wheat will move for the most part by rail and water from the terminals in Detroit and Toledo. The wheat remaining in Michigan is prepared in two basic ways for human consumption. The wheat of poorer milling quality moves to Battle Creek to be used in the production of breakfast foods which are distributed to most parts of the United States. The better quality wheat is milled in the many mills of the state, the larger of which are located in Augusta, Chelsea, Detroit, Dowagiac, Grand Rapids, Hillsdale, and Monroe. These mills specialize in the production of pastry flour with a low protein content which is known as "spread

cookie" flour. This flour is excellent for use in the bakery for the baking of cakes, cookies, doughnuts, and pie crust. Much of this flour moves to the East and South. Michigan specializes in this way and is dependent upon mills in other states for much of its bread flour.

Illinois and Indiana. The states of Illinois and Indiana can best be considered together. These states are closely related in their production and distribution of wheat and flour. Soft red winter wheat is grown predominately in both states. In Illinois it is grown in abundance in the southern sector of the state. In Indiana it is grown in all parts except in the northeast sector. This soft red winter wheat is of exceptional quality due to the special soil conditions which exist in both states. This soil possesses a beneficial limestone content which is not found in most of the wheat-growing regions of the United States. Also, Illinois produces some hard red winter wheat in the central part of the state, lesser amounts of hard red spring wheat in the northern part, and a small quantity of white wheat in the southwestern part of the state. Indiana produces some hard red spring and hard red winter wheats. They are grown in all sectors of the state except in the northeastern sector. This mixture of spring and winter wheat is due to climatic conditions. In most years the winter wheat will survive the winter's cold, but in years having particularly severe winters the fields are partially winter-killed and must be resown with spring wheat.

Illinois and Indiana do not consume all of the wheat they produce. Most of this surplus wheat moves to the terminals in Chicago and St. Louis. From Chicago wheat moves eastward by rail and water to greater consuming areas. However, some of the wheat moving by rail from these states will move through Indianapolis to the East. That portion of the wheat which moves to St. Louis will move by rail and by water to the Southeast or to the Gulf ports for export to foreign countries. The wheat which remains in Illinois and Indiana finds a market with one of the many mills in these two states. The larger mills in Illinois are located in Alton, Beardstown, Belleville, Chicago, Evansville, Freeburg, Lebanon, Mascoutah, Pinchneyville, Pittsfield, Red Bud, Springfield, Steeleville, and Trenton. Indiana has many small mills, and a few larger mills in Evansville, Fort Wayne, Greensburg, Indianapolis, Ligonier, Mount Vernon, and Seymour. These mills produce more flour than is consumed in Illinois and Indiana. The flour milled from the soft red winter wheat is excellent for bakery products in which exceptional color and texture are desired. This flour moves to the southern states in the form of biscuit flour and to the North Atlantic states in the form of pastry flour. The flour milled from the hard red winter wheat grown in these states is also of excellent quality. This is due to the varieties of hard red winter wheat grown in this region. These varieties could be classified as semi-soft wheats.

This wheat produces flour which can be used for the baking of cake as well as bread. This fact causes a wide demand for this flour for blending with flour of lesser quality in the states east and south of Illinois and Indiana.

Wisconsin. The state of Wisconsin is of lesser importance than the preceding states. Hard red spring wheat and hard red winter wheat are grown in appreciable quantity in this state. The spring wheat is grown in the southern part, and the winter wheat is grown in the central sector of Wisconsin. Some soft red winter wheat is grown in the southwestern part, and some durum wheats are grown in the northwestern sector of the state. Most, if not all, of this wheat is utilized locally with a considerable amount of the poorer quality wheat being used as feed. The mills in Wisconsin require more wheat than they are able to purchase locally. These mills must draw wheat from other states to the west. Most of this wheat which is shipped into Wisconsin is durum wheat which is milled in the larger mills in Superior and New Richmond. The bread wheats are nearly all supplied locally for the many small mills scattered throughout the state. Only a small quantity of bread flour is shipped out of Wisconsin to the East by rail and by water. For the most part this flour satisfies the local demand. The products of the durum wheat move to all parts of the United States due to their specialized character which is in demand in nearly every state.

Minnesota. Minnesota is one of the most important wheat-growing and flour-milling states. The wheat handling and flour milling centers about the city of Minneapolis. This city is one of the major terminals and gateways for the wheat-producing region to its west. It is also the home of the five largest milling firms in the United States. From Minneapolis wheat and flour move to nearly all points west of the Mississippi River and to the Atlantic Coast by rail and by water from the ports of Duluth and Superior for consumption and for export to foreign countries.

Minnesota produces hard red spring wheat primarily. This wheat is grown throughout the state. A lesser amount of hard red winter wheat is grown in the central and southeastern sectors, and some durum wheats are grown in the northwestern part of the state. This wheat production does not fulfill the demands of the mills in Minnesota and much of the wheat for milling must be drawn from the states to the west. The larger mills, producing bread flour, are located in Appleton, Cannon Falls, Hastings, Lake City, Mankato, Minneapolis, Montgomery, New Prague, New Ulm, Red Wing, St. Paul, Springfield, Wabasha, and Winona. The larger mills grinding durum wheat are located in Crookston, Faribault, Minneapolis, and St. Paul. Durum wheat products move to all parts of the United States. Much of the surplus bread flour is shipped to the North Atlantic states and many other points east of the Mississippi River.

North Dakota. The state of North Dakota is in the heart of the spring wheat growing region. It is also the major producer of durum wheats. Much more hard red spring wheat and durum wheat are grown than is utilized in North Dakota. This wheat is grown throughout the state, and the surplus for the most part moves through the Minneapolis Gateway. That portion of the bread wheat remaining in the state is milled in Great Forks, Mandan, Minot, and Valley City, and the many smaller milling centers. This flour production is greater than the demand within North Dakota. The surplus flour is shipped eastward for the most part. However, some flour from North Dakota is consumed in eastern Montana and Wyoming. A majority of the durum wheat milling is centered in Great Forks. The products of this mill are shipped to many points throughout the United States.

South Dakota. South Dakota has a more diversified wheat production than any state described thus far. Hard red spring wheat is produced in the northern part of the state and constitutes the most predominate wheat grown. However, hard red winter wheat and durum wheats are grown in quantity in the southern part of the state, and some white wheat is grown in the west-central and southeastern sectors. Only a small percentage of this wheat is utilized in South Dakota. It is shipped through the Minneapolis Gateway for the most part. Most of that wheat which is milled within the state is consumed locally. Nevertheless, some of the flour moves from

the milling center in Rapid City to eastern Wyoming, Colorado, Montana, and Western Nebraska. This movement of flour is of little importance compared to the movement from the important milling states previously discussed.

Iowa. The last state in this group is Iowa. It is one of the least important wheat-growing states in this region. The soil and climate of Iowa are more suited for the production of other crops. It is interesting to note that Iowa produces all of the market classes of wheat. The majority of this production is hard red winter wheat. This wheat is grown in the southern and western sectors of the state, and it is predominately of the semi-hard varieties. These varieties are not of sufficient quality to be milled unless they are blended with better quality wheat. The less important market classes of wheat grown in Iowa are soft red winter, hard red spring, white, and durum wheats. The soft red winter wheat is grown in the southern part of the state. The hard red spring wheat is grown in the northwestern sector. The white wheat and the durum wheats are produced in the west-central sector of Iowa. Hard red winter wheat is the only market class of any important commercial value, although this wheat is not grown in sufficient quantity to supply the larger mills in Cedar Rapids, Davenport, and Des Moines, and the smaller mills of the state. Additional wheat from the Southwest supplements the local wheat. Some of this blended wheat usually moves eastward through Chicago. The flour produced by the smaller mills is consumed

locally, but some of the flour from the larger mills is shipped to points east of the Mississippi River. A part of the flour milled in Des Moines is shipped to eastern Nebraska. The total amount of flour leaving Iowa is only a small percentage of that which is milled within the state. The flour for the most part is consumed locally.

The Southwestern States

The great winter wheat territory of the United States is included in the southwestern states. These states furnish a great part of the United States with the wheat and flour which is used in the baking of bread. These states include Missouri, Nebraska, Kansas, Oklahoma, and Texas.

Missouri. The first of this group of states is Missouri. This state is a major producer of soft red winter wheat. This wheat is grown in quantity in all sectors of the state except in the northeastern and south-central parts. Some hard red winter wheat is grown in the north, northwest, and west-central sections of Missouri. Much of this wheat is not utilized locally. The surplus is moved by rail and by water to the East and South. A major part moves through the St. Louis terminal and other Mississippi River crossings.

The soft red winter wheat grown in the valleys in the southeastern sections of Missouri is milled into excellent cake flour, while this class of wheat produced elsewhere in

the state produces excellent pastry flour as well as bread flour. The majority of the hard red winter wheat is of the semi-hard varieties. Most of this wheat is utilized locally; however, some of it is milled into sponge flour used in the baking of crackers in the East.

The mills in Missouri require more wheat than is grown locally. This wheat comes, for the most part, from the great terminal in Kansas City. This terminal, or gateway, will be described in the discussion of the state of Kansas, for it is from the Kansas wheat fields that the Kansas City terminal receives a majority of its wheat. The great milling capacity of Missouri centers in Clinton, Farmington, Frederickton, Higginsville, Independence, Jackson, Jefferson City, Kansas City, New Haven, Oran, St. Joseph, St. Louis, St. Marys, Sikeston, Slater, and Springfield. There are other mills in the state but these mills are the most important. All of the flour produced in Missouri is not consumed locally, but it moves to the consuming areas of the East and Southeast.

Nebraska. Nebraska is the first state in this group producing an important amount of hard red winter wheat. This wheat is grown in the southern two-thirds of the state and in the northwest sector. Also, some hard red spring wheat is grown in this northwest part, and a lesser quantity of soft red winter wheat and durum wheats is grown respectively in the southeastern and northcentral parts of Nebraska. Much of this wheat, which is not utilized in the state, moves

through the Omaha terminal and the Kansas City Gateway. From these points it can move east and south for consumption or export.

The milling in Nebraska is characterized by a group of large mills in Crete, Fremont, Grand Island, Hastings, Lexington, Lincoln, Omaha, and Wymore, plus a group of smaller mills in the eastern part of the state. Much of the flour, which is not consumed locally, moves to eastern points to be used in the baking of bread. However, some of the low protein flour is shipped to the Southeast for consumption in the home.

Kansas. The most important wheat-producing state is Kansas. Hard red winter wheat is grown in enormous quantity in the western two-thirds of the state. Less than one-half of this wheat is utilized by the great mills of the state. The surplus is utilized in many mills in the United States and exported to many countries of the world. The surplus wheat grown in the northern two-thirds of Kansas will, for the most part, move through the Kansas City Gateway. Before reaching Kansas City it may be stored in a sub-terminal such as is found in Salina. From Kansas City this wheat may go directly to the mills in Missouri, or it will move to most points east of the Mississippi River. Some of this wheat will be shipped by barge down the Missouri and Mississippi Rivers or by rail to the Gulf ports for export. The surplus wheat grown in the southern one-third of Kansas will be shipped directly or through sub-terminals, such as Wichita, to points in Oklahoma,

Texas, or the Gulf and Texas ports. Only a minor quantity of this surplus wheat from southern Kansas will move through the Kansas City Gateway or directly to mills in Missouri. Some of the hard red winter wheat and a lesser amount of the hard red spring wheat, grown in western Kansas, will move to mills in New Mexico and Arizona. Under conditions of a short, bread-wheat crop in the western states, particularly Montana and Idaho, wheat will move from western Kansas to California and to the Pacific Northwest.

Soft red winter wheat is grown in the eastern one-third of Kansas. This wheat is predominately of the semi-hard varieties. It is milled locally, or it moves through the Kansas City Gateway or to mills in Missouri. The flour produced from this wheat is mostly sponge flour and low protein flour which is consumed in the Southeast.

The majority of the flour produced in the enormous milling industry in Kansas is excellent bread flour. The only exception to this is some of the flour milled from Chiefkan type, hard red winter wheat which is grown in some western sections of the state. Approximately 95 per cent of all of the flour milled in Kansas is consumed outside the state. This flour moves much as the surplus wheat does. The majority of it moves eastward to most points east of the Mississippi River. Some flour is shipped to Arizona, New Mexico, and California. The larger mills of this great milling state are located in Abilene, Arkansas City, Atchison, Buhler, Cherryvale, Claflin,

Clay Center, Coffeyville, Dodge City, Ellinwood, Fort Scott, Great Bend, Hays, Hutchinson, Kansas City, Kingman, Larned, Lawrence, Leavenworth, Liberal, Lindsborg, McPherson, Moundridge, Newton, Russell, Salina, Sterling, Topeka, Wellington, Wichita, Wilson, and Winfield.

Oklahoma. Oklahoma is another outstanding winter wheat producing state. Hard red winter wheat is grown in great quantity in the Oklahoma panhandle and the western two-thirds of the state. Most of the wheat is of the more desirable types; however, some of the less desirable Chiefkan type is grown. Much of this wheat is not utilized within the state. This surplus wheat of poorer quality moves directly to Texas ports for export. The better quality surplus wheat moves through Enid and Oklahoma City to the southern and South Atlantic states. When the nation's carry-over of bread wheats is short the first of the new crop harvested in Oklahoma will move to almost any point within the United States. This is due to the fact that wheat is harvested earliest in Oklahoma and Texas. The first wheat of the new crop may move to Kansas City, Colorado, or the Pacific Northwest, depending upon where the shortage of wheat is most acute. This early movement could be called natural due to its frequent occurrence in recent years. Throughout the year wheat moves from the Oklahoma panhandle and the western sectors of the state to Mexico by railroad and the combination of rail and water. This wheat is usually the less desirable of the bread types.

In the eastern part of Oklahoma a semi-hard type of soft red winter wheat is grown. Surplus wheat of this class and surplus flour milled from this class move eastward. This is true of the surplus flour milled throughout the state. However, some of the flour, not consumed locally, from the mills in western Oklahoma will move to consumers in Arizona. The larger mills in Oklahoma are located in Alva, Blackwell, Chickasha, El Reno, Enid, Kingfisher, Okeene, Oklahoma City, Ponca City, Shawnee, and Yukon.

Texas. The last state in this group is Texas. This is another major wheat-producing state. Like Oklahoma, the movement of the first wheat of a new crop is unlike the movement throughout the year. The new crop wheat will move to any point of shortage when there is a short carry-over. The market classes of wheat grown in Texas are similar to those grown in Oklahoma. Hard red winter wheat is grown in all sectors of Texas except the extreme southern part. Soft red winter wheat is grown in the central and eastern sections, and a small amount of durum wheats is grown in the central-northeastern and central-southeastern sections of the state. This wheat production is not entirely required by the mills in Texas. Some of the surplus wheat which is grown in the western sector of the state moves into Mexico by rail from El Paso and by the rail-water route. The majority of the surplus wheat moves to the Texas ports, principally Galveston, for shipment to the east coast and to foreign countries.

The mills in Texas produce more flour than can be consumed locally. The surplus flour from central and eastern Texas is shipped to the consumers in the Southeast. The surplus flour milled in western Texas moves to Arizona, New Mexico, and Mexico. Some flour is exported from the Texas ports. The majority of the flour is milled in Amarillo, Dallas, Denton, Fort Worth, Gainesville, Galveston, Hereford, Houston, New Braunfels, Plainview, San Antonio, Sherman, and Wichita Falls.

The Western States

The mountainous territory west of the Great Plains is the most diverse agricultural region in the United States. Many differences in soil and climate cause extreme variation in the quantity and quality of the wheat produced. The annual rainfall alone causes many of these differences in production. Many problems arise from these variations, not only in the growing of wheat, but also in the milling of flour and the distribution of the finished product. This makes the natural movement of wheat and flour difficult to describe accurately.

The states included in this western group are Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, and California.

Montana. The first of the western states is Montana. The wheat grown in this state in some years is predominately

spring wheat and in other years winter wheat. This is due to the variations in the severity of the winters and the amount of rainfall in the fall and winter. In the central and northern sectors of Montana, winter wheat does not receive sufficient moisture in some years to sprout in the fall, or it is frozen during the winter and must be replanted in the spring. Irrigation has helped to solve a part of this problem. However, only one-quarter of the wheat land is irrigated.

In normal years hard red spring wheat is grown predominately in Montana, mostly in the northern and eastern sections of the state. Hard red winter wheat is grown in the central and southcentral sectors, and the soft red winter wheat is grown in the northwestern and southcentral sectors. Also, a small quantity of durum wheats is grown in the northeast, and white wheat is grown in the western and southcentral parts of Montana. Only a small percentage of this wheat is required by the mills in the state. The surplus wheat of poorer quality is utilized as feed. This constitutes a large quantity of wheat due to the difference between the cost of locally grown wheat and the cost of other feed grains which are not grown in sufficient quantity to satisfy local demand. This is true of many of the western states. The livestock and poultry feeders are forced by price to utilize wheat instead of the more beneficial feed grains. A majority of the surplus wheat of better quality is grown in the eastern one-third of Montana

and moves through the Minneapolis Gateway. The movement of surplus wheat from the western two-thirds of the state is to Washington, Oregon, and California for export and for milling.

The mills in Montana produce several times more flour than is consumed locally. The major part of this surplus flour moves to the consuming areas of California. Some of this flour is exported from the ports on the west coast, and some of the flour milled in eastern Montana moves to Wyoming and other eastern points. The major mills which produce this surplus of flour are located in Billings, Bozeman, Great Falls, Harlowton, Lewistown, and Sidney.

Idaho. The state of Idaho is unique in the type of wheat it produces predominately. This is white wheat of a special soft type. It is grown in the irrigated land in the northern and eastern sections of the state. From this white wheat is milled cake flour of extraordinarily good quality. This wheat, and the flour milled from it, is shipped to nearly all states in the United States. This is due to two factors. The superior quality of this wheat and flour will overcome most price disadvantages in comparison with other wheat and flour utilized in cake baking. Also, the freight rates from Idaho to most points within the United States are advantageous.

Another important market class of wheat produced in Idaho is hard red winter wheat. Tais class of wheat is grown in the eastern sector of the state. Some hard red spring wheat is grown in the northern and eastern sectors, and some soft red

winter wheat is grown in the northern part of Idaho. These wheats are grown mostly on nonirrigated land, and they are utilized for the most part as feed. However, the better quality wheat grown in the northern part of the state is blended with wheat from Montana which moves to the North Pacific coast for consumption and for export. The better quality wheat grown in the southern sectors moves through the Ogden terminal. Some of the hard red winter wheat grown in this sector moves to mills in California.

This movement is made possible because the mills in Idaho require only one-fourth of the wheat grown in the state. These mills specialize in the milling of cake and biscuit flour from the white wheat. The surplus flour produced by these mills moves almost everywhere as it has been described previously. The larger mills are located in Burley, Pocatello, Twin Falls, and Weiser. The other mills of less important size when combined with the larger mills produce more than twice as much flour as is consumed in the state. This gives rise to a considerable movement of flour out of Idaho.

Wyoming. A state of lesser importance in this group is Wyoming. This state produces slightly more wheat and flour in certain sectors than is utilized locally. Hard red winter wheat is the market class grown in the greatest quantity in Wyoming. Hard red spring wheat takes its place only after extremely dry falls or extremely cold winters. These wheats are grown for the most part in the northwestern, central, and

southern parts of the state. In the southcentral section of Wyoming some durum wheats are grown, and a lesser quantity of soft red winter and white wheats are grown in the northern part of the state. A major part of this wheat is used as feed. Most of the better quality wheat is milled within the state. However, the surplus wheat from the western part of Wyoming moves to the Ogden terminal; from the northeastern sectors wheat moves to Minneapolis; and from the southeastern sector wheat moves to Omaha.

Wyoming has only one major mill located in Sheridan and a group of smaller mills. The flour produced in these mills is consumed locally for the most part. Some flour moves eastward and becomes lost with the great mass of flour moving in this direction.

Colorado. Colorado is a major wheat-producing state. The Great Plains extends into the eastern part of Colorado to the Rocky Mountains. These mountains cause a division in the state, and the agricultural territories have become known as the Eastern Slope and the Western Slope. There are also some high-altitude valleys and plateaus which grow a considerable quantity of wheat. The major market class of wheat grown in Colorado is hard red winter. However, this winter wheat must occasionally be replaced by hard red spring wheat when adverse winter growing conditions prevail. These classes are grown in the southeastern plains region, and the northcentral and southcentral valley and plateau regions. The Western Slope

produces some white wheat. Only one-third of this wheat is utilized in Colorado. The surplus from the Western Slope moves through the Ogden terminal and directly to California. The surplus from the Eastern Slope, which is predominately high quality hard red winter wheat, moves eastward to Omaha and to Kansas City. A lesser quantity moves to New Mexico and Arizona. In years in which there is a short bread-wheat crop in the states west of Colorado some wheat will move from the Eastern Slope to these states.

Twice as much flour is milled in Colorado as is consumed. Most of the flour milled in the small mills on the Western Slope is consumed locally. However, the surplus will move for the most part to California. The larger mills in Denver, Greeley, Lamar, and Pueblo, and the smaller mills on the Eastern Slope ship flour to the East and to the Southeast. Some of this surplus flour moves south into Arizona and New Mexico. Most of this flour is the finest bread type, and it is able to compete with other bread flours easily.

New Mexico. The state of New Mexico is not a major wheat-producing or flour-milling state. Hard red winter wheat is grown in some quantity in the northern and eastern sectors of the state. A recognizable amount of hard red spring wheat is grown in the northern half of New Mexico and some white wheat is grown in the southern sectors of the state. The hard red winter and hard red spring wheats, which compose the major part of the wheat production, are not utilized entirely within

New Mexico. Most of this wheat is blended with other wheats for milling in California. Some of the wheat from the southern part of the state is shipped to Mexico, and some of the wheat from the eastern part of New Mexico moves to Texas ports for export.

The flour milled in New Mexico is not sufficient to satisfy the requirements of even the small population. However, only a part of the flour milled in New Mexico is of sufficient quality to create demand within the state. The flour of lesser quality is shipped to Mexico, while local consumption is satisfied with flour from mills to the North and East. Much of the wheat and flour going to Mexico passes through El Paso. This city could be called the gateway for wheat and flour to Mexico.

Arizona. Arizona is a minor wheat-producing and flour-milling state. White wheat is grown throughout the state, and some hard red winter and hard red spring wheats are grown in the northern half of Arizona. Most of this wheat is not of milling quality. It is utilized as feed or blended in small quantities with other wheats for milling. All of the wheat which is not required locally in Arizona moves to California and to Mexico. Most of the better quality flour milled in the small mills is consumed locally, and the poorer quality flour is shipped to Mexico.

Utah. The state of Utah is a major producer of hard red winter and white wheats. Only a small quantity of soft red winter wheat is grown in the northeastern part of the state,

and a lesser amount of hard red spring wheat is grown in the eastern part of Utah. The wheat of poorer quality is utilized as feed, and the wheat of better quality is milled within the state. However, a large quantity of wheat moves through the Ogden Gateway to Arizona and New Mexico, and to California from the states to the North and East. Some of this wheat also is milled in Utah in the larger mills in Salt Lake City and Ogden, and the smaller mills scattered throughout the state. Much of the flour produced in these mills is consumed locally, and the surplus moves to California, New Mexico, Arizona, and Nevada.

Nevada. Nevada has only a small agricultural area in the northwest portion of the state. Some hard red winter, hard red spring, and white wheats are grown in this region. For the most part this wheat is not of milling quality. This causes it to be utilized as feed in Nevada and California. However, some of this wheat is blended with strong wheats from Utah, Montana, and Idaho for milling in the six small mills in Nevada. These mills do not produce enough flour for local consumption. A major part of the flour consumed in the state is milled in Utah, Montana, and Idaho.

Washington. The state of Washington is a major wheat-producing state. A major part of the wheat grown is white wheat. This is grown mostly in the southeastern sector of the state. It is divided between the soft and the hard types of white wheat. The hard type is utilized as livestock feed.

The other important market class of bread wheat is hard red winter wheat which is grown throughout the eastern part of Washington. Also, grown in this area are soft red winter wheat and hard red spring wheat. Both of the latter classes are of little importance. The total wheat production in Washington is more than three times greater than the milling requirements of the state. Much of the surplus wheat is exported from Seattle and Portland or shipped by rail or by water to California. Some of this wheat and some flour move by boat to the East Coast by way of the Panama Canal. The other surplus flour is shipped by rail, for the most part, to the consuming areas of California. This surplus of flour is produced in the larger Washington mills in Ritzville, Seattle, Spokane, Waitsburg, Wenatchee, Charleston, and Huntington. These mills produce excellent pastry and bread flours, especially from the white wheat of the soft type.

Oregon. Oregon produces the same classes of wheat as Washington. The major market class is white wheat. The major part is grown in the eastern part of the state. This white wheat is mostly the better milling type. Also, in the eastern part of Oregon, hard red winter wheat is grown in important quantity. Some hard red spring wheat is grown in the northern and southeastern sectors of the state, and some soft red winter wheat is grown in the northwest part of Oregon. The poorer quality wheat is utilized as feed due to the inadequate supply of other feed grains. Much of the surplus wheat

is moved by boat on the Columbia River and by rail to Portland for export and for shipment by boat to the East Coast. Also, an important quantity of the surplus wheat moves by rail to the mills in California.

The mills in Oregon produce several times the amount of flour utilized within the state. A majority of the surplus flour moves by rail to California and by boat to the East Coast and to foreign countries. The major part of the flour milled in Oregon is produced in the larger mills in Astoria, Athena, Freewater, Helix, Pendleton, and Portland.

California. The last state in this group is California. This state cannot be considered as a major wheat-producing state, although white wheat is grown in considerable quantity along the coast and in the central valleys. This wheat is of extremely poor quality, and it is utilized as feed for the most part. A small percentage of it is milled and shipped to Mexico. Some hard red winter wheat is grown and consumed in northern California. This state has several large mills in Los Angeles, Sacramento, and Valleho, which mill wheat grown mostly in other states. The flour produced in these large mills and the smaller mills does not satisfy the demand for flour. A considerable part of the flour consumed in California must come from mills in other states. Not all of the wheat and flour which is shipped to California is consumed within the state. Some of it is exported from San Francisco, Los Angeles, and San Diego.

CONCLUSIONS CONCERNING THE NATURAL MOVEMENT OF WHEAT AND FLOUR WITHIN THE UNITED STATES

Problems Arising from the Natural Movement

Before 1890 wheat and flour were not moved throughout the nation according to Kuhlmann (21, p. 280). Natural movement of wheat was from the farm to the local mill. Natural movement of flour was from the local mill to the home. But specialization of farm production, large-scale milling, and extreme improvements in transportation have made possible this great expansion of the export and domestic market place. This systematic scheme as it is known today was developed from a haphazard system as these industries became more formidable. The localized scheme was endangered by adverse growing conditions and operational failure of the local mill. The development of the natural movement eliminated this danger and made the economy of the nation more secure. However, new problems have appeared in this highly developed system. One of these is the problem of the periodical breakdown in the transportation system. These breakdowns are caused by adverse weather conditions and by strikes. These problems are being solved by technological improvement and understanding of labor-management difficulties but, as all major improvements in our economic and social life, these problems take time to solve. Another problem which is facing these allied industries today is the

balancing of the factors involved in this scheme in the United States. The specialization of agriculture and large-scale milling have led to over-producing. Heimann (15, p. 85) states that the classical economists worried with the problem of the over-production of population before the industrial revolution. These economists calculated that an increase in the population would eventually outrange the food which could be produced with methods of their time. They did not consider that the increasing rate of population would be hampered by tragedy and education, or that agricultural technology would be able to increase the productivity of the land as well as restore agricultural areas which had little productiveness left due to continuous misuse. These advantageous factors have caused a problem of over-production which could be minimized by education or crop failures. Education is especially slow when the producer must eliminate part of his income in the present in hopes of restoring it in the future. Crop failures of great enough magnitude to solve the problem seem to be virtually impossible considering the past 10 years. This over-production extends the natural movement to the greatest possible extremes, limited only by transportation facilities. If the facilities for moving this over-production to all world markets were as efficient as the production within the United States, this problem would be minimized. As the situation prevails today, the natural movement of wheat and flour is becoming unnatural because of the limited number of markets due

to transportation limitations. This unnatural movement may increase and eliminate the wheat-growing areas which produce wheat of lesser quality, for there is a continuing demand for wheat of better quality and slackening demand for poorer quality wheat. It may eliminate the less efficient mills, and those mills producing flour of lesser quality. This would cause the natural movement to become even more systematic than it is today. It would limit the number of producers that could compete for the consumers' business. Unless transportation facilities are improved rapidly or some unforeseen demand for wheat and flour occurs, this is the trend which the natural movement will probably follow.

The Unnatural Movements of Wheat and Flour

This study has dealt for the most part with the natural movement of wheat and flour within the United States. This is the way the majority of the wheat and flour will move if it is controlled only by those factors discussed. However, wheat and flour do move to many points which are unnatural. Each of these unnatural movements has a specific explanation. Each is different from the next and particularly difficult to describe in general. However, there are some important causes for the unnatural movement of wheat and flour occurring frequently which can be described.

Special advantageous freight rates from one given point

to another given point are one of the principal causes for the unnatural movement. These are extremely numerous. They have been caused by pressure groups, usually the farmers or the millers at the point of origin, securing a lower freight rate to a particular market so as to compete with others who already participate in this market.

Advertising and salesmanship have caused some of the unnatural movements of wheat and flour. This is particularly true of the national brand flours which command a higher price in the market because of the demand which has been caused by advertising. This higher price is not usually profit. It is necessary to cover the cost of advertising and of the unnatural movement to many markets. However, nationally advertised brands of flour do move generally with the natural movements causing their prices to be only slightly higher.

Government supervision and interference with the free marketing of wheat has caused some unnatural movement. The greatest interference occurred during the war emergency. This interference has continued in the post-war period to a lesser extent. There are arguments for and against government interference. This is a vast subject within itself, and will not be discussed here.

Special qualities in wheat and flour cause some of the unnatural movement. This is usually a short-run factor. It is caused by certain areas producing a crop of wheat which has special, desirable qualities due to an exceptional growing season. This wheat, and the flour milled from it, will command

a wider demand. This demand will cause some of it to move unnaturally.

In general the unnatural movement cannot be condemned or praised as economically sound. Each situation in which it occurs is different and must be considered separately. In most cases there are two sides, each representing its own interest and trying to prove that this interest is the public interest, or the interest which will best serve the greatest number of people.

The Stability of the Natural Movement

The natural movement of wheat and flour within the United States is ever-changing in minor details. When any of the factors causing wheat and flour to move as they do change, an alteration occurs in the natural movement. In the short-run the natural movement could be described as inelastic, but in the long-run the natural movement is more elastic. Productivity, consumers' demand, and government regulations change comparatively slow. However, over a period of time the aggregate of the changes in these factors has a definite influence. It is doubtful that the general scheme of the natural movement will be eliminated entirely unless our present system of government changes radically.

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